



# Mathematical Reasoning

14 questions	12 questions	17 questions	17 questions	8 questions	12 questions
Number Sense	Statistics, Data Analysis, Probability	Algebra and Functions	Measurement and Geometry	Math Reasoning	Algebra I

Eight of the 80 CAHSEE multiple-choice questions are based on 6 selected standards from the grade 7 Mathematical Reasoning strand. Each Mathematical Reasoning question used on the CAHSEE is also linked to one of the other strands. When CAHSEE results are reported to students and parents, the Mathematical Reasoning results are not reported separately; instead, the results are reported under the linked strand.

## WHAT DO THE MATHEMATICAL REASONING STANDARDS ASK ME TO DO?

“Mathematical Reasoning” includes the logical thinking skills that you develop while learning mathematics and can carry over into other disciplines.

The Mathematical Reasoning strand includes:

- recognizing and generalizing patterns
- identifying and organizing relevant information
- validating conjectures both inductively and deductively

## WHY IS MATHEMATICAL REASONING IMPORTANT?

After high school, you’ll need to find answers to questions such as these:

- Where should I live?
- What college should I go to?
- What kind of work matches my aspirations and skills?

How do people make such important life decisions? Some people make many decisions based entirely on intuition and emotion. But often, better decisions can be made by gathering facts, asking for advice, and considering the consequences of choosing various options. This kind of thinking—reasoning from known facts to reach a logical conclusion—is central to mathematics and is essential for successful problem solving in almost all aspects of adult life.

## MATHEMATICAL REASONING

### HOW WILL THE CAHSEE TEST MY KNOWLEDGE OF MATHEMATICAL REASONING?

The CAHSEE tests 6 of the 14 grade 7 standards from the Mathematical Reasoning strand. To illustrate how the Mathematical Reasoning standards are tested, we'll look at three sample CAHSEE questions from this strand.

**7MR1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns. [2 questions]**

**Sample CAHSEE Question**

A flower shop delivery van traveled these distances during one week: 104.4, 117.8, 92.3, 168.7, and 225.6 miles. How many gallons of gas were used by the delivery van during this week?

**What other information is needed in order to solve this problem?**

- A** the average speed traveled in miles per hour
- B** the cost of gasoline per gallon
- C** the average number of miles per gallon for the van
- D** the number of different deliveries the van made

M00138

**Mathematical Solution**

- The correct answer is **C**. Please refer to the next column for a description of the solution.

**Descriptive Solution**

Adding the five numbers gives you the total miles the van was driven during the whole week. But how much gasoline was used? We need more information. If we knew how many miles the van could travel on one gallon of gas—miles per gallon—we could find the gallons used by dividing the total miles traveled by the number of miles per gallon. Which of the four choices gives information about gallons of gasoline and miles traveled? Choice **C**, “The average number of miles per gallon for the van,” is what you need. (This Mathematical Reasoning question is linked to Algebra and Functions standard 7AF1.1.)

7MR1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed. [1 question]

Sample CAHSEE Question

If  $n$  is any odd number, which of the following is true about  $n + 1$ ?

- A It is an odd number.
- B It is an even number.
- C It is a prime number.
- D It is the same number as  $n - 1$ .

M00155

Mathematical Solution

- The correct answer is **B**. Please refer to the next column for a description of the solution.

Descriptive Solution

Every whole number is either odd or even. A whole number is even if it can be divided evenly by two; the numbers 2, 4, 6, 8, 10, 12, . . . are even. In this question we are given the information that  $n$  is an odd number. Because  $n$  is odd, it must be one of the numbers 1, 3, 5, 7, 9, 11, 13, 15, and so on. Now we have to reason mathematically. If  $n$  is a member of this “odd” list, then what can we say for sure about  $n + 1$ ? If we add 1 to each number in the odd list, we get the “ $n + 1$ ” list: 2, 4, 6, 8, 10, 12, 14, 16, and so on, which are even numbers. Therefore, the correct answer is **B** because the “ $n + 1$ ” list consists of only even numbers. (This Mathematical Reasoning question is also linked to Algebra and Functions standard 7AF1.1.)

**7MR3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations. [1 question]**

**Sample CAHSEE Question**

Len runs a mile in 8 minutes. At this rate how long will it take him to run a 26-mile marathon?

**Which of the following problems can be solved using the same arithmetic operations that are used to solve the problem above?**

- A** Len runs 26 miles in 220 minutes. How long does it take him to run each mile?
- B** A librarian has 356 books to place on 18 shelves. Each shelf will contain the same number of books. How many books can the librarian place on each shelf?
- C** A cracker box weighs 200 grams. What is the weight of 100 boxes?
- D** Each basket of strawberries weighs 60 grams. How many baskets can be filled from 500 grams of strawberries?

M00137

**Mathematical Solution**

- The correct answer is **C**. Please refer to the next column for a description of the solution.

**Descriptive Solution**

Often the same mathematical idea or skill can apply in very different situations. That's what you have to do in this problem. The correct answer is **C**. Here is why. In the original problem, Len runs one mile in 8 minutes, so you'd have to multiply 8 by 26 to get the minutes it would take him to run the 26 miles at the same rate. The arithmetic operation used to solve this problem is multiplication. Which of the choices, A, B, C, or D, requires multiplication?

In choice A, you'd have to divide the 220 minutes by 26 to get the time for one mile. For choice B, the total number of books would have to be divided by the number of shelves to get the books per shelf. Finally, in choice D, to find the number of baskets you'd have to divide the 500 grams by 60. But to figure out choice C, the weight of one box of crackers, 200 grams, would have to be multiplied by 100 to find the weight of all the boxes. Only in choice **C** would you have to multiply, as in the original problem. (This Mathematical Reasoning question is also linked to Number Sense standard 7NS1.2.)

## MATHEMATICAL REASONING

Here are the other three Mathematical Reasoning standards tested on the CAHSEE:

**7MR2.1** Use estimation to verify the reasonableness of calculated results.  
[2 questions]

**7MR2.3** Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.  
[1 question]

**7MR2.4** Make and test conjectures by using both inductive and deductive reasoning. [1 question]

In the sample questions that follow, questions 2, 3, and 4 are based on these three Mathematical Reasoning standards, respectively.

Now try out your Mathematical Reasoning skills by doing the sample questions. Check your answers using the answer key provided in the appendix at the back of this Study Guide.

(Note: The CAHSEE questions used as examples throughout this Study Guide and in the following sample questions were used on prior CAHSEEs. These items will not be used in future CAHSEEs.)

## ADDITIONAL MATHEMATICAL REASONING SAMPLE QUESTIONS

1. Chris drove 100 kilometers from San Francisco to Santa Cruz in 2 hours and 30 minutes. What computation will give Chris' average speed, in kilometers per hour?

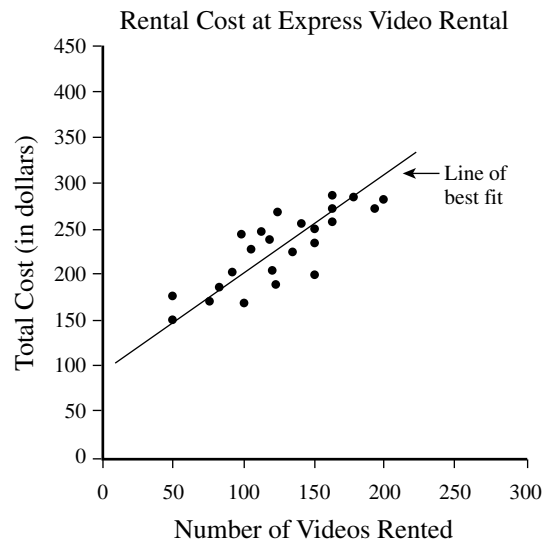
A Divide 100 by 2.5.  
B Divide 100 by 2.3.  
C Multiply 100 by 2.5.  
D Multiply 100 by 2.3.

M03164

2. Which is the BEST estimate of  $326 \cdot 279$ ?

A 900  
B 9,000  
C 90,000  
D 900,000

M00277



3. Using the line of best fit shown on the scatterplot above, which of the following BEST approximates the rental cost per video to rent 300 videos?

A \$3.00  
B \$2.50  
C \$2.00  
D \$1.50

M02209

4. The winning number in a contest was less than 50. It was a multiple of 3, 5, and 6. What was the number?

- A 14
- B 15
- C 30
- D It cannot be determined.

M00393